

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



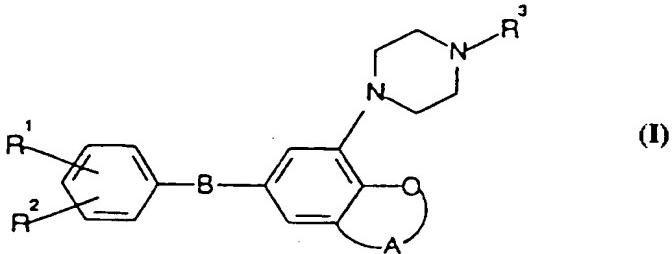
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : C07D 307/79, 319/18, 405/12, 413/12, A61K 31/495	A1	(11) International Publication Number: WO 95/11243 (43) International Publication Date: 27 April 1995 (27.04.95)
(21) International Application Number: PCT/EP94/03387		(81) Designated States: JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
(22) International Filing Date: 13 October 1994 (13.10.94)		
(30) Priority Data: 9321490.6 19 October 1993 (19.10.93) GB 9325866.3 17 December 1993 (17.12.93) GB		Published <i>With international search report.</i>
(71) Applicant (for all designated States except US): SMITHKLINE BEECHAM PLC [GB/GB]; New Horizons Court, Brentford, Middlesex TW8 9EP (GB).		
(72) Inventors; and		
(75) Inventors/Applicants (for US only): JOINER, Graham, Francis [GB/GB]; SmithKline Beecham Pharmaceuticals, Coldharbour Road, The Pinnacles, Harlow, Essex CM19 5AD (GB). GASTER, Laramie, Mary [GB/GB]; SmithKline Beecham Pharmaceuticals, Coldharbour Road, The Pinnacles, Harlow, Essex CM19 5AD (GB).		
(74) Agent: FLORENCE, Julia; SmithKline Beecham, Corporate Intellectual Property, SB House, Great West Road, Brentford, Middlesex TW8 9BD (GB).		

(54) Title: BENZANILIDE DERIVATIVES AS SHT-1D RECEPTOR ANTAGONISTS

(57) Abstract

Amide derivatives of formula (I) or a salt thereof, in which R¹ is halogen, C₃-cycloalkyl, optionally substituted phenyl or an optionally substituted 5-7-membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur, R² is hydrogen, halogen, C₁-alkyl, C₁-alkoxy, acyl, nitro, trifluoromethyl or cyano; R³ is hydrogen or C₁-alkyl; and A is -(CR⁴R⁵)_m- or -O(CR⁴R⁵)_n- where R⁴ and R⁵ are independently hydrogen or C₁-alkyl, m is 2, or 3; n is 1, 2 or 3 and B is CONH or NHCO, processes for their preparation, and pharmaceutical compositions containing them.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

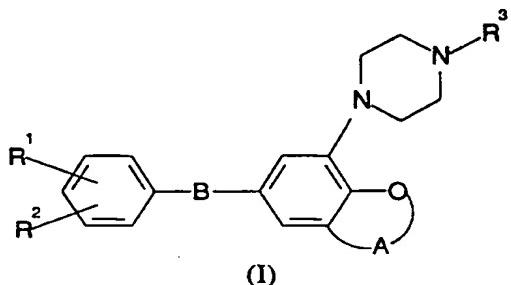
AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

BENZANILIDE DERIVATIVES AS 5HT-1D RECEPTOR ANTAGONISTS

The present invention relates to novel amide derivatives, processes for their preparation, and pharmaceutical compositions containing them.

5 EPA 0 533 266/7/8 disclose a series of benzanilide derivatives which are said to possess 5HT_{1D} receptor antagonist activity. These compounds are said to be of use in the treatment of various CNS disorders.

10 A structurally distinct class of compounds have now been discovered and have been found to exhibit 5HT_{1D} antagonist activity. In a first aspect, the present invention therefore provides a compound of formula (I) or a salt thereof:



15 in which

R¹ is halogen, C₃-6cycloalkyl, optionally substituted phenyl or an optionally substituted 5-7-membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur;

20 R² is hydrogen, halogen, C₁-6alkyl, C₁-6alkoxy, acyl, nitro, trifluoromethyl or cyano; R³ is hydrogen or C₁-6alkyl; and

A is -(CR⁴R⁵)_m- or -O(CR⁴R⁵)_n- where R⁴ and R⁵ are independently hydrogen or C₁-6alkyl, m is 2, or 3;

n is 1, 2 or 3 and

B is CONH or NHCO.

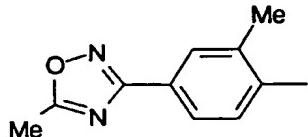
25 The group R¹ can be an aromatic or saturated heterocyclic ring. When R¹ is an aromatic heterocyclic ring, examples of such rings include thienyl, furyl, pyrrolyl, triazolyl, diazolyl, imidazolyl, oxadiazolyl, isothiazolyl, isoxazolyl, thiadiazolyl, pyrimidyl and pyrazinyl. When R¹ is a saturated ring examples include piperidine, morpholine and piperazine rings. The group R¹ can be linked to the remainder of the molecule via a carbon atom or, when present, a nitrogen atom. Examples of R¹ C₃-6cycloalkyl groups include cyclohexyl.

30 Preferably the group R¹ is attached to the 4-position of the phenyl ring, that is to say, para to the amide group. Optional substituents for R¹, of which more than one can be present, include halogen, C₁-6alkyl, C₁-6alkoxy, hydroxy, cyano, nitro, amino, CO₂R⁶

where R⁶ is hydrogen or C₁₋₆alkyl or CONR⁷R⁸ where R⁷ and R⁸ are hydrogen or C₁₋₆alkyl.

The group R¹ can also be an optionally substituted phenyl group, in particular a phenyl group disubstituted by C₁₋₆alkyl and an optionally substituted 5 to 7-membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur. Preferred 5 to 7-membered heterocyclic rings include those listed above. Preferred substituents for such rings include C₁₋₆alkyl, in particular methyl.

Preferably R¹ is halogen, pyridyl or a phenyl group disubstituted by a C₁₋₆alkyl group and an optionally substituted 5-7 membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur. More preferably R¹ is a phenyl group disubstituted by methyl and an optionally substituted oxadiazolyl group, in particular an oxadiazolyl group substituted by C₁₋₆alkyl. Most preferably R¹ is a group of formula:



15

Suitably R² is hydrogen, halogen, C₁₋₆alkyl, C₁₋₆alkoxy or nitro. Preferably R² is hydrogen, methyl or nitro, most preferably hydrogen.

Suitably R³ is hydrogen or C₁₋₆alkyl. Preferably R³ is hydrogen or methyl.

20 Preferably A is CH₂CH₂ or OCH₂CH₂.

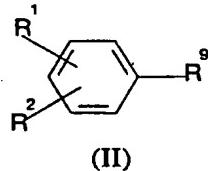
Preferably B is CONH.

Particularly preferred compounds include:

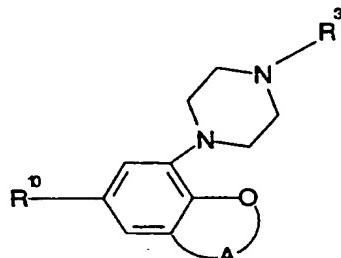
4-bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide,
4-bromo-3-methyl-N-[7-(piperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide,
25 4-bromo-3-methyl-N-[5-(4-methylpiperazin-1-yl)-1,4-benzodioxan-7-yl]benzamide,
4-(4-pyridyl)-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-
yl]benzamide,
4-(4-pyridyl)-3-methyl-N-[5-(4-methylpiperazin-1-yl)-1,4-benzodioxan-7-yl]benzamide,
N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]-2'-methyl-4'-(5-
30 methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide, or
N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-yl]-2'-methyl-4'-(5-
methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide,
N-[7-(Piperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-
1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide,
35 4-Bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-
yl]benzamide,

- N-[7-(piperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide,
 4-Bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]benzamide,
 5 N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide,
 N-[7-(Piperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide,
 or a pharmaceutically acceptable salt thereof.
- 10 C₁₋₆alkyl groups, whether alone or as part of another group, may be straight chain or branched.
- Preferred salts of the compounds of formula (I) are pharmaceutically acceptable salts. These include acid addition salts such as hydrochlorides, hydrobromides, phosphates, acetates, fumarates, maleates, tartrates, citrates, oxalates, methanesulphonates and p-toluenesulphonates.
- 15 Certain compounds of formula (I) are capable of existing in stereoisomeric forms. It will be understood that the invention encompasses all geometric and optical isomers of the compounds of formula (I) and the mixtures thereof including racemates. Tautomeric forms of compounds of formula (I) and mixtures thereof also form an aspect of the invention.
- 20 In a further aspect the present invention provides a process for the preparation of a compound of formula (I) which comprises.

(a) reaction of a compound of formula (II):



with a compound of formula (III):

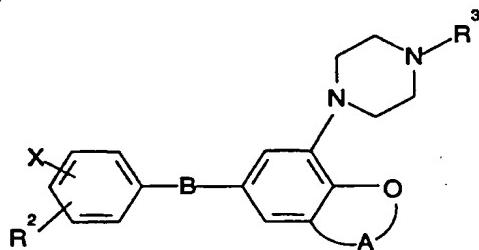


(III)

in which R¹, R², R³ and A are as defined in formula (I) and R⁹ and R¹⁰ contain the appropriate functional group(s) necessary to form the B moiety;

5

(b) reaction of a compound of formula (IV):



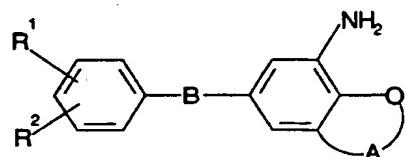
10

(IV)

in which R², R³, A and B are as defined in formula (I) and X is a leaving group with a nucleophile R¹ where R¹ is as defined in formula (I); or

15

(c) reaction of a compound of formula (V):



(V)

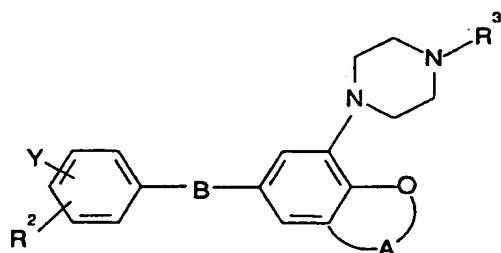
20

in which R¹, R², A and B are as defined in formula (I) with a compound of formula (VI):

25

in which R³ is as defined in formula (I) and Hal is halogen, or

(d) reaction of a compound of formula (VII):



- 5 in which R^2 , R^3 , A and B are as defined in formula (I) and Y is halogen or a group - OSO_2CF_3 with a compound of formula (VIII):



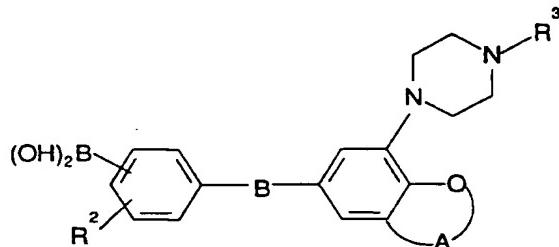
10

(VIII)

in which R^1 is as defined in formula (I), or

(e) reaction of a compound of formula (IX):

15



(IX)

- 20 in which R^2 , R^3 , A and B are as defined in formula (I) with a compound of formula (X):



(X)

25

in which R^1 is as defined in formula (I) and Y is as defined in formula (VII), and optionally thereafter:

- converting a compound of formula (I) into another compound of formula (I)
- forming a pharmaceutically acceptable salt.

Suitably one of R⁹ or R¹⁰ is an activated carboxylic acid derivative, such as an acyl halide or acid anhydride, and the other is an amine group. Activated compounds of formulae (II) or (III) can also be prepared by reaction of the corresponding carboxylic acid with a coupling reagent such as carbonyldiimidazole, dicyclohexylcarbodiimide or 5 diphenylphosphorylazole. Preferably R⁹ or R¹⁰ is a group COL where L is halo, particularly chloro.

- A compound of formulae (II) and (III) are typically reacted together in an inert organic solvent such as DMF, THF or dichloromethane at ambient or elevated temperature in the presence of a base such as triethylamine, pyridine or aqueous sodium hydroxide.
- 10 Compounds of formulae (II) and (III) can be prepared from the corresponding carboxylic acids using standard procedures. For example acid chlorides can be prepared by reaction with phosphorous pentachloride, oxalyl chloride or thionyl chloride. Acid anhydrides can be prepared by reaction with a suitable acid anhydride, for example trifluoroacetic anhydride.
- 15 Reaction of a compound of formula (IV) with a nucleophile R¹ is preferably carried out in a suitable solvent such as dimethylformamide in the presence of a strong base such as sodium hydride. Preferably the leaving group X is halo, in particular fluoro. Preferably the group R² is an electron withdrawing group, for example nitro, COCH₃ or cyano, in the ortho or para-positions relative to the group X.
- 20 Reaction of a compound of formula (V) with a compound of formula (VI) is suitably carried out in an alcohol or nitrile solvent with an optional base or, alternatively, in a non-polar solvent such as chlorobenzene in the absence of base. Suitably, the reactions are carried out at ambient or elevated temperature, preferably at the reflux temperature of the reaction mixture.
- 25 Reaction of compounds of formula (VII) and (VIII) and reaction of compounds of formulae (IX) and (X) can be carried out in the presence of a transition metal catalyst such as Pd(PPh₃)₄ in a solvent such as an ether in the presence of a base such as an alkali metal carbonate or bicarbonate, for example sodium carbonate or bicarbonate, at ambient or elevated temperature.
- 30 Intermediate compounds of formulae (III), (IV), (V), (VI), (VII), (VIII), (IX) and (X) are commercially available or can be prepared using standard procedures. For example certain compounds can be prepared using similar procedures to those outlined in EPA 533266/7/8.
- 35 It will be appreciated to those skilled in the art that it may be necessary to protect certain reactive substituents during some of the above procedures, for example when the group R³ is a hydrogen atom. Standard protection and deprotection techniques can be used. For example, primary amines can be protected as phthalimide, benzyl, benzyloxycarbonyl or trityl derivatives. These groups can be removed by conventional

procedures.

Carboxylic acid groups can be protected as esters. Aldehyde or ketone groups can be protected as acetals, ketals, thioacetals or thioketals. Deprotection is achieved using standard conditions.

5 SHT_{1D} Antagonists, and in particular the compounds of the present invention, are expected to be of use in the treatment of CNS disorders such as mood disorders, including depression, seasonal effective disorder and dysthymia; anxiety disorders, including generalised anxiety, panic disorder, agoraphobia, social phobia, obsessive compulsive disorder and post-traumatic stress disorder; memory disorders, including dementia, 10 amnestic disorders and age-associated memory impairment; and disorders of eating behaviours, including anorexia nervosa and bulimia nervosa. Other CNS disorders include Parkinson's disease, dementia in Parkinson's disease, neuroleptic-induced Parkinsonism and tardive dyskinesias, as well as other psychiatric disorders.

15 SHT_{1D} Antagonists, and in particular compounds of the present invention, may also be of use in the treatment of endocrine disorders such as hyperprolactinaemia, in the treatment of vasospasm (particularly in the cerebral vasculature) and hypertension, as well as disorders in the gastrointestinal tract where changes in motility and secretion are involved. They may also be of use in the treatment of sexual dysfunction.

20 Therefore, the present invention, provides a compound of general formula (I) or a physiologically acceptable salt or solvate thereof for use in therapy.

The present invention also provides a compound of general formula (I) or a physiologically acceptable salt or solvate thereof for use in the treatment of the aforementioned disorders.

25 In another aspect the invention provides the use of a compound of general formula (I) or a pharmaceutically acceptable salt or solvate thereof for the manufacture of a medicament for the treatment of the aforementioned disorders.

30 In a further aspect the invention provides a method of treating the aforementioned disorders which comprises administering an effective amount to a patient in need of such treatment of a compound of general formula (I) or a pharmaceutically acceptable salt or solvate thereof.

In particular the invention provides a compound of general formula (I) or a physiologically acceptable salt or solvate thereof for use in the treatment or prophylaxis of depression.

35 It will be appreciated by those skilled in the art that the compounds according to the invention may advantageously be used in conjunction with one or more other therapeutic agents, for instance, different antidepressant agents.

The present invention also provides a pharmaceutical composition, which comprises a compound of formula (I) or a pharmaceutically acceptable salt thereof, and a

pharmaceutically acceptable carrier.

A pharmaceutical composition of the invention, which may be prepared by admixture, suitably at ambient temperature and atmospheric pressure, is usually adapted for oral, parenteral or rectal administration and, as such, may be in the form of tablets, 5 capsules, oral liquid preparations, powders, granules, lozenges, reconstitutable powders, injectable or infusible solutions or suspensions or suppositories. Orally administrable compositions are generally preferred.

Tablets and capsules for oral administration may be in unit dose form, and may contain conventional excipients, such as binding agents, fillers, tabletting lubricants, 10 disintegrants and acceptable wetting agents. The tablets may be coated according to methods well known in normal pharmaceutical practice.

Oral liquid preparations may be in the form of, for example, aqueous or oily suspension, solutions, emulsions, syrups or elixirs, or may be in the form of a dry product for reconstitution with water or other suitable vehicle before use. Such liquid preparations 15 may contain conventional additives such as suspending agents, emulsifying agents, non-aqueous vehicles (which may include edible oils), preservatives, and, if desired, conventional flavourings or colorants.

For parenteral administration, fluid unit dosage forms are prepared utilising a compound of the invention or pharmaceutically acceptable salt thereof and a sterile 20 vehicle. The compound, depending on the vehicle and concentration used, can be either suspended or dissolved in the vehicle. In preparing solutions, the compound can be dissolved for injection and filter sterilised before filling into a suitable vial or ampoule and sealing. Advantageously, adjuvants such as a local anaesthetic, preservatives and buffering agents are dissolved in the vehicle. To enhance the stability, the composition 25 can be frozen after filling into the vial and the water removed under vacuum. Parenteral suspensions are prepared in substantially the same manner, except that the compound is suspended in the vehicle instead of being dissolved, and sterilisation cannot be accomplished by filtration. The compound can be sterilised by exposure to ethylene oxide before suspension in a sterile vehicle. Advantageously, a surfactant or wetting agent is 30 included in the composition to facilitate uniform distribution of the compound.

The composition may contain from 0.1% to 99% by weight, preferably from 10 to 60% by weight, of the active material, depending on the method of administration.

The dose of the compound used in the treatment of the aforementioned disorders will vary in the usual way with the seriousness of the disorders, the weight of the sufferer, 35 and other similar factors. However, as a general guide suitable unit doses may be 0.05 to 1000 mg, more suitably 1.0 to 200 mg, and such unit doses may be administered more than once a day, for example two or three a day. Such therapy may extend for a number of weeks or months.

When administered in accordance with the invention, no unacceptable toxicological effects are expected with the compounds of the invention.

The following Examples illustrate the preparation of pharmacologically active compounds of the invention.

Description 1**2,3-dihydrobenzofuran-7-carboxylic acid (D1)**

Following the procedure outlined in EP-A-307172, Example 15, 2,3-dihydrobenzofuran
5 (10.73g) was converted to the title compound (D1) (6g, 41%).

^1H NMR 250 MHz (CDCl_3) δ : 8.76 (brs, 1H), 7.82 (d, 1H), 7.42 (d, 1H), 6.95 (t, 1H),
4.8 (t, 2H), 3.3 (t, 2H)

10 Description 2**7-(trifluoroacetylamino)-2,3-dihydrobenzofuran (D2)**

2,3-dihydrobenzofuran-7-carboxylic acid (D1) (1.42g) was dissolved in a mixture of
trifluoroacetic acid (50 ml) and trifluoroacetic anhydride (10 ml). After stirring at room
15 temperature for 1.5 h, the mixture was cooled to 0° C and treated portionwise with sodium
azide (1.4 eq = 788 mg), then stirred at room temperature for 2 days under argon. The
mixture was evaporated under reduced pressure, and the residue partitioned between
 CHCl_3 and water. The organic phase was washed with K_2CO_3 (aq), dried (Na_2SO_4) and
the solvent evaporated under reduced pressure, to give the title compound (1.64g, 82%) as
20 an off-white crystalline material.

^1H NMR 250 MHz (CDCl_3) δ : 7.85-8.2 (m, 2H), 7.05 (d, H), 6.89 (t, H), 4.65 (t, 2H),
3.28 (t, 2H)

25 Description 3**7-amino-2,3-dihydrobenzofuran (D3)**

A solution of 7-(trifluoroacetylamino)-2,3-dihydrobenzofuran (D2) (1.6g) in methanol
(30 ml) and 10% NaOH (3 ml) was heated to reflux for 24 h. The mixture was evaporated
30 under reduced pressure and partitioned between ethyl acetate and water. The organic
phase was dried (Na_2SO_4) and the solvent evaporated under reduced pressure to give the
title compound (900 mg, 96%) as a pale orange oil, which crystallised on standing.

^1H NMR 200 MHz (CDCl_3) δ : 6.44-6.75 (m, 3H), 4.57 (t, 2H), 3.55 (br s, 2H), 3.2 (t,
35 2H)

Description 4**7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran (D4)**

A solution of 7-amino-2,3-dihydrobenzofuran (D3) (2g) in chlorobenzene (15 ml) was
5 treated with mechlorethamine hydrochloride (2.85 g) and the mixture refluxed overnight
under Argon. The solvent was evaporated under reduced pressure and the residue was
dissolved in 1-butanol (30 ml) and treated with Na₂CO₃ (6.28 g). After refluxing under
Argon for a further 24 h, the solvent was evaporated under reduced pressure and
partitioned between ethyl acetate and water. Organic phase was dried (Na₂SO₄) and
10 solvent evaporated under reduced pressure to give the title compound as a red oil (1.32 g,
41%).

¹H NMR 250 MHz (CDCl₃) δ : 6.69-7.0 (m, 3H), 4.6 (t, 2H), 3.05-3.35 (m, 6H), 2.52-
2.73 (m, 4H), 2.35 (s, 3H)

15

Description 5**7-(4-methylpiperazin-1-yl)-5-nitro-2,3-dihydrobenzofuran (D5)**

Potassium nitrate (705 mg) was added portionwise over ½h to a solution of 7-(4-
20 methylpiperazin-1-yl)-2,3-dihydrobenzofuran (D4) (1.32 g) in concentrated sulphuric acid
(16 ml) at room temperature. The resulting solution was stirred for a further ½ h, then
added to ice (40 g), basified with 5N NaOH, and extracted into ethyl acetate. The organic
phase was dried (Na₂SO₄) and the solvent evaporated under reduced pressure to give the
title compound (847 mg, 53%) as an orange, crystalline solid.

25

¹H NMR 250 MHz (CDCl₃) δ : 7.79 (s, 1H), 7.64 (s, 1H), 4.78 (t, 2H), 3.1-3.38 (m, 6H),
2.5-2.7 (m, 4H), 2.36 (s, 3H)

Description 6**7-(4-methylpiperazin-1-yl)-5-amino-2,3-dihydrobenzofuran (D6)**

A solution of 7-(4-methylpiperazin-1-yl)-5-nitro-2,3-dihydrobenzofuran (D5) (845 mg) in
ethanol (50 ml) was hydrogenated over 10% Palladium on charcoal (0.5 g) at atmospheric
pressure and room-temperature for 1 h. The catalyst was removed by filtration through
35 kieselguhr, and the filtrate evaporated under reduced pressure to give the title compound
(741 mg, 99%).

¹H NMR 250 MHz (CDCl₃) δ : 6.25 (s, 1H), 6.1 (s, 1H), 4.53 (t, 2H), 2.5-3.3 (m, 12H),

2.35 (s, 3H).

Description 7

7-Nitro-1,4-benzodioxan-5-carboxylic acid (D7)

5

Benzodioxan-5-carboxylic acid (prepared as described by E.A.Watts, in Azabicycloalkylbenzamides and pharmaceutical compositions containing them, EP 82-303057 June 1982) (15 g) was dissolved in a mixture of glacial acetic acid (67 ml) and acetic anhydride (67 ml). The solution was heated to 40° C and treated with a solution 10 of fuming nitric acid (13 ml) in acetic acid (13 ml) at a rate such that the temperature was maintained at 45-50° C with occasional ice/water cooling. The mixture was stirred at 50°-53° C for 2 days, then cooled and filtered to give the title compound as a white powder (4.09 g, 22%).

15 ^1H NMR 250 MHz (DMSO-d6) δ : 8.09 (s, 1H), 7.85 (s, 1H), 4.28-4.59 (m, 4H).

Description 8

7-amino-1,4-benzodioxan-5-carboxylic acid (D8)

20 A solution of 7-nitro-1,4-benzodioxan-5-carboxylic acid (D7) (2.81 g) in ethanol (100 ml) was hydrogenated over 10% Palladium on charcoal (750 mg) for 20 h. The catalyst was removed by filtration through kieselguhr and the filtrate evaporated under reduced pressure to give the title compound as a white solid (1.96 g, 81%)

25 ^1H NMR 200 MHz (DMSO-d6) δ : 6.5 (s, 1H), 6.26 (s, 1H), 4.03-4.3 (m, 4H), 3.4 (br s, 2H).

Description 9

4-bromo-3-methyl-N-[5-carboxy-1,4-benzodioxan-7-yl]benzamide (D9)

30

Following the method outlined in Example 1, 7-amino-1,4-benzodioxan-5-carboxylic acid (D8) (1.96 g) was converted to the title compound as an off-white powder (3.19 g, 81%).

35 ^1H NMR 250 MHz (DMSO-d6) δ : 10.19 (s, 1H), 7.96 (s, 1H), 7.72 (s, 2H), 7.36 (s, 1H), 7.30 (s, 1H), 4.12-4.25 (m, 4H), 2.42 (s, 3H)

Description 10**4-Bromo-3-methyl-N-[5-(trifluoroacetylamino)-1,4-benzodioxan-7-yl]benzamide (D10)**

- 5 Following the method outlined in description 2, 4-bromo-3-methyl-N-[5-carboxy-1,4-benzodioxan-7-yl]benzamide (D9) (1.0 g) was converted to the title compound (739 mg, 63%).

10 ^1H NMR 200 MHz (DMSO-d₆) δ : 10.89 (s, 1H), 10.23 (s, 1H), 7.92 (s, 1H), 7.56-7.8 (m, 2H), 7.42 (s, 1H), 7.39 (s, 1H), 4.19-4.46 (m, 4H), 2.42 (s, 3H)

Description 11**4-bromo-3-methyl-N-[5-amino-1,4-benzodioxan-7-yl]benzamide (D11)**

- 15 Following the method outlined in description 3, 4-bromo-3-methyl-N-[5-(trifluoroacetylamino)-1,4-benzodioxan-7-yl]benzamide (D10) (1.85 g) was converted to the title compound (137 mg).

20 ^1H NMR 250 MHz (CDCl₃) δ : 7.7 (s, 1H), 7.55-7.65 (m, 2H), 7.45 (d, 1H), 6.8 (s, 1H), 6.5 (s, 1H), 4.2-4.38 (m, 4H), 3.81 (br s, 2H), 2.44 (s, 3H).

Description 12**2,3-dihydro-2-methylbenzofuran-7-carboxylic acid (D12)**

- 25 Following the procedure outlined in EP-A-307172, Example 15, 2,3-dihydro-2-methylbenzofuran (10.62g) was converted to the title compound (7.33g, 52%).

30 ^1H NMR 250MHz (CDCl₃) δ : 7.82 (d, 1H), 7.38 (d, 1H), 6.95 (t, 1H), 5.3-5.1 (m, 1H), 3.5-3.3 (m, 1H), 3.0-2.8 (m, 1H), 1.58 (d, 3H)

Description 13**7-(trifluoroacetylamino)-2,3-dihydro-2-methylbenzofuran (D13)**

- 35 Following the procedure outlined in description 2, 2,3-dihydro-2-methylbenzofuran-7-carboxylic acid (D12) (7.33g) was converted to the title compound (8.36g, 83%).

1H NMR 200 MHz (CDCl₃) δ : 8.08-7.8 (m, 2H), 7.01 (d, 1H), 6.87 (t, 1H), 5.12-4.92 (m, 1H), 3.46-3.29 (m, 1H), 2.97-2.8 (m, 1H), 1.5 (d, 3H).

Description 14**7-amino-2,3-dihydro-2-methylbenzofuran (D14)**

5 Following the procedure outlined in description 3, 7-(trifluoroacetylamo)-2,3-dihydro-2-methylbenzofuran (D13) (8.36g) was converted to the title compound (4.83g, 95%)

1H NMR 200 MHz (CDCl_3) δ : 6.74-6.45 (m, 3H), 5.01-4.81 (m, 1H), 3.76-3.2 (m, 3H), 2.9-2.71 (m, 1H), 1.48 (d, 3H).

10

Description 15**7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran (D15)**

A solution of 7-amino-2,3-dihydro-2-methylbenzofuran (D14) (4.83g) in 1-butanol
15 (80 ml) was treated with mechlorethamine hydrochloride (12.5 g) and the mixture refluxed under argon for 24 h. Sodium carbonate (13.7 g) was added and reflux continued for 48h. The solvent was evaporated under reduced pressure and the residue was partitioned between 10% (aq) sodium hydroxide and dichloromethane. The organic phase was dried (Na_2SO_4) and the solvent removed under reduced pressure to give a residue which was
20 chromatographed on silica, eluting with ethylacetate and n-pentane to give the title compound as an orange oil (4g, 53%)

1H NMR 200 MHz (CDCl_3) δ : 6.86-6.65 (m, 3H), 5.05-4.84 (m, 1H), 3.37-3.0 (m, 5H), 2.9-2.73 (m, 1H), 2.69-2.51 (m, 4H), 2.35 (s, 3H), 1.5 (d, 3H).

25

Description 16**7-(4-methylpiperazin-1-yl)-5-nitro-2,3-dihydro-2-methylbenzofuran (D16)**

Following the procedure outlined in description 5, 7-(4-methylpiperazin-1-yl)-2,3-dihydro-
30 2-methylbenzofuran (D15) (4g) was converted to the title compound (2.81g, 59%)

1H NMR 250 MHz (CDCl_3) δ : 7.75 (s, 1H), 7.64 (s, 1H), 5.25-5.04 (m, 1H), 3.45-3.05 (5H), 2.94-2.8 (m, 1H), 2.72-2.51 (m, 4H), 2.37 (s, 3H), 1.55 (d, 3H)

Description 17**5-amino-7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran (D17)**

Following the procedure outlined in description 6, 7-(4-methylpiperazin-1-yl)-5-nitro-2,3-dihydro-2-methylbenzofuran (D16) (2.81g) was converted to the title compound (2.57g, quantitative).

¹H NMR 250MHz (CDCl₃) δ : 6.2 (s, 1H), 6.1 (s, 1H), 5.0-4.78 (m, 1H), 3.54-2.89 (m, 7H), 2.81-2.49 (m, 5H), 2.35 (s, 3H), 1.46 (d, 3H)

10

Description 18**7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran (D18)**

Following the procedure outlined in description 15, 2,3-dihydro-2,2-dimethyl-7-benzofuranamine (4.93g) was converted into the title compound (2.48g, 33%)

¹H NMR 250 MHz (CDCl₃) δ : 6.85-6.65 (m, 3H), 3.29-3.09 (m, 4H), 2.98 (s, 2H), 2.7-2.51 (m, 4H), 2.34 (s, 3H), 1.49 (s, 6H).

20 **Description 19****7-(4-methylpiperazin-1-yl)-5-nitro-2,3-dihydro-2,2-dimethylbenzofuran (D19)**

Following the procedure outlined in description 5, 7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran (D18) (2.48g) was converted to the title compound (1.46g, 50%)

25

¹H NMR 200 MHz (CDCl₃) δ : 7.72 (s, 1H), 7.61 (s, 1H), 3.29-3.14 (m, 4H), 3.05 (s, 2H), 2.65-2.52 (m, 4H), 2.35 (s, 3H), 1.52 (s, 6H)

Description 20**5-Amino-7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran (D20)**

Following the procedure outlined in description 6, 7-(4-methylpiperazin-1-yl)-5-nitro-2,3-dihydro-2,2-dimethylbenzofuran (D19) (1.46g) was converted to the title compound (1.06g, 81%)

35

¹H NMR 250 MHz (CDCl₃) δ : 6.19 (s, 1H), 6.11 (s, 1H), 3.25-3.04 (m, 4H), 2.9 (s, 2H), 2.68-2.51 (m, 4H), 2.35 (s, 3H), 1.45 (s, 6H)

Example 1**4-bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide (E1)**

- 5 4-bromo-3-methylbenzoic acid (690 mg) was refluxed for 1 h in thionyl chloride (10 ml), then cooled to room-temperature and evaporated under reduced pressure to leave the acid chloride. A solution of 7-(4-methylpiperazin-1-yl)-5-amino-2,3-dihydrobenzofuran (D6) (740 mg) in tetrahydrofuran (50 ml) was treated with a solution of the acid chloride (749 mg) in tetrahydrofuran (10 ml) and sodium hydroxide (0.26 g) in water (4 ml). The
10 mixture was stirred for three days under Argon at room temperature, then the solvent was evaporated under reduced pressure, and the residue partitioned between ethyl acetate and water. The organic phase was dried (Na_2SO_4), the solvent evaporated under reduced pressure and the residue passed through a short silica (flash) column, eluting with methanol/ethyl acetate(1%-6%), to give the title compound (810 mg, 59%), mp 93-5° C.
15 ^1H NMR 250 MHz (CDCl_3) δ : 7.74 (s, 2H), 7.62 (d, 1H), 7.5 (d, 1H), 7.23 (s, 1H), 6.86 (s, 1H), 4.62 (t, 2H), 3.03-3.32 (m, 6H), 2.52-2.71 (m, 4H), 2.46 (s, 3H), 2.35 (s, 3H).

Example 2

- 20 **4-bromo-3-methyl-N-[7-(piperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide hydrochloride (E2)**

A solution of 4-bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide (E1) (250 mg) in dry toluene (4 ml) was cooled to 0° C and treated with
25 α -chloroethyl chloroformate (166 mg). The mixture was stirred at room temperature for 1h, and filtered through kieselguhr. The filtrate was evaporated under reduced pressure and the residue dissolved in a mixture of dry toluene (5 ml) and methanol (4 ml) and stirred at room temperature overnight. The solvents were evaporated under reduced pressure to leave the title compound as an orange solid (65 mg) mp 129-132° C°.

- 30 ^1H NMR 250 MHz (DMSO-d_6) δ : 10.15 (s, 1H), 9.25 (br s, 2H), 7.94 (s, 1H), 7.65-7.77 (m, 2H), 7.4 (s, 1H), 7.2 (s, 1H), 4.54 (t, 2H), 3.05-3.32 (m, 10H), 2.42 (s, 3H).

Example 3

- 35 **4-bromo-3-methyl-N-[5-(4-methylpiperazin-1-yl)-1,4-benzodioxan-7-yl]benzamide (E3)**

A solution of 4-bromo-3-methyl-N-[5-amino-1,4-benzodioxan-7-yl]benzamide (D11) (128

mg) in 1-butanol (2 ml) was treated with mechlorethamine hydrochloride (136 mg) and the mixture refluxed under Argon overnight. Na₂CO₃ (150 mg) was added and the mixture refluxed for a further 24 h under Argon. The mixture was partitioned between dichloromethane and 10% NaOH, the organic phase dried (Na₂SO₄) and the solvent evaporated under reduced pressure. Purification on preparative tlc plate (Si) eluting with 7.5% ethanol/chloroform gave the title compound as a tan foam (90 mg, 57%) mp 70-73° C.

10 ¹H NMR 250 MHz (CDCl₃) δ : 7.66-7.82 (m, 2H), 7.62 (d, 1H), 7.5 (d, 1H), 6.96 (s, 1H), 6.8 (s, 1H), 4.16-4.45 (m, 4H), 2.98-3.29 (m, 4H), 2.54-2.78 (m, 4H), 2.45 (s, 3H), 2.36 (s, 3H).

Example 4

15 4-(4-pyridyl)-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide (E4)

To a solution of 4-bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide (E1) (300 mg) in dimethoxyethane (10 ml) was added successively, 4-pyridylboronic acid (146 mg), sodium carbonate (192 mg) in water (5 ml) and 20 tetrakis(triphenylphosphine)palladium (0) (50 mg). The mixture was stirred at reflux under argon for 40 h, diluted with water and extracted into chloroform. The organic phase was dried (Na₂SO₄) and evaporated under reduced pressure and the residue purified by column chromatography (silica) eluting with methanol and chloroform (1%-4%), to give the title compound (204 mg, 68%), mp 90-3° C.

25 ¹H NMR 250 MHz (CDCl₃) δ : 8.7 (d, 2H), 7.7-8 (m, 3H), 7.22-7.4 (m, 4H), 6.91 (s, 1 H), 4.64 (t, 2H), 3.05-3.35 (m, 6H), 2.52-2.77 (m, 4H), 2.26-2.49 (m, 6H)

Example 5

30 4-(4-pyridyl)-3-methyl-N-[5-(4-methylpiperazin-1-yl)-1,4-benzodioxan-7-yl]benzamide (E5)

Following the method outlined in example 4, 4-bromo-3-methyl-N-[5-(4-methylpiperazin-1-yl)-1,4-benzodioxan-7-yl]benzamide (E3) (73 mg) was converted to the title compound, 35 and purified on preparative tlc plate (SiO₂) eluting with 15% ethanol/chloroform (42 mg, 58%) mp 230° C+ (dec)

¹H NMR 250 MHz (CDCl₃) δ : 8.7 (d, 2H), 7.82 (s, 2H), 7.75 (d, 1H), 7.21-7.37 (m,

3H), 7.01 (s, 1H), 6.85 (s, 1H), 4.2-4.38 (m, 4H), 3.01-3.25 (m, 4H), 2.55-2.78 (m, 4H), 2.38 (s, 3H), 2.34 (s, 3H).

Example 6

- 5 **N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide (E6)**

2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)-1,1'-biphenyl-4-carboxylic acid (EP 0533 268A1) (200 mg) was heated under reflux in excess thionyl chloride (5 ml) under argon 10 for 1 hr, and the excess thionyl chloride evaporated under reduced pressure. The resulting acid chloride was dissolved in tetrahydrofuran (25 ml) and treated with 5-amino-7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran (D17) (176 mg) in tetrahydrofuran (10 ml), and a solution of sodium hydroxide (57 mg) in water (1 ml). The mixture was stirred at room temperature overnight then the solvent was evaporated under reduced 15 pressure. The residue was partitioned between water and dichloromethane, the organic phase was dried (Na_2SO_4) and the solvent evaporated under reduced pressure, to give the title compound as a brown foam (339 mg, 91%).

20 ^1H NMR 250 MHz (CDCl_3) δ : 8.06-7.86 (m, 4H), 7.8 (s, 1H), 7.45 (d, 2H), 7.34 (d, 1H), 7.25 (d, 1H), 6.86 (s, 1H), 5.06-4.88 (m, 1H), 3.38-3.0 (m, 5H), 2.9-2.74 (m, 1H), 2.69 (s, 3H), 2.65-2.51 (m, 4H), 2.39-2.26 (m, 6H), 1.5 (d, 3H).

Example 7

- 25 **N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide (E7)**

Following the procedure outlined in example 6, 5-amino-7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran (D20) (186 mg) was converted to the title compound (258 mg, 68%)

30 ^1H NMR 250 MHz (CDCl_3) δ : 8.06-7.89 (m, 4H), 7.81 (s, 1H), 7.45 (d, 2H), 7.35 (d, 1H), 7.25 (d, 1H), 6.84 (s, 1H), 3.3-3.09 (m, 4H), 3.0 (s, 2H), 2.75-2.5 (m, 7H), 2.41-2.22 (m, 6H), 1.49 (s, 6H).

Example 8**N-[7-(Piperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide hydrochloride (E8)**

- 5 A solution of N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide (E7) (150 mg) in dichloromethane (20 ml) was cooled to 0° C and treated with α -chloroethyl chloroformate (0.04 ml) and diisopropylethylamine (0.55 ml). The mixture was refluxed for 3h, cooled and filtered through a short neutral alumina column eluting with dichloromethane, then 10 ethyl acetate. The solvent was evaporated under reduced pressure, and the residual carbamate dissolved in methanol (10 ml) and stood overnight. The solvent was evaporated under reduced pressure to leave the title compound as a white powder (38 mg, 22%) Mp 175-180° C.
- 15 ^1H NMR 250 MHz (CD_3OD) δ : 8.08-7.98 (m, 3H), 7.94 (d, 1H), 7.57-7.47 (m, 2H), 7.39 (d, 1H), 7.27 (s, 1H), 7.19 (s, 1H), 3.4 (s, 8H), 3.06 (s, 2H), 2.68 (s, 3H), 2.35 (s, 3H), 1.5 (s, 6H).

Example 9**4-Bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-yl]benzamide (E9)**

Following the procedure outlined in example 1, 5-amino-7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran (D20) (300 mg) was converted to the title compound 25 (230mg, 44%) Mp 81-83° C.

^1H NMR 200 MHz (CDCl_3) δ : 7.72 (br s, 2H), 7.61 (d, 1H), 7.50 (d, 1H), 7.19 (s, 1H), 6.8 (s, 1H), 3.18 (br s, 4H), 2.99 (s, 2H), 2.67-2.51 (m, 4H), 2.45 (s, 3H), 2.35 (s, 3H), 1.49 (s, 6H).

Example 10**N-[7-(piperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide hydrochloride (E10)**

- 35 Following the procedure outlined in example 8, N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide (E6) (150 mg) was converted to the title compound (55 mg, 35%) Mp 150-155° C.

¹H NMR 250 MHz (DMSO-d₆) δ: 10.19 (s, 1H), 9.22 (br s, 2H), 8.16-7.85 (m, 4H), 7.61-7.75 (m, 2H), 7.49-7.39 (m, 2H), 7.24 (s, 1H), 5.04-4.85 (m, 1H), 3.48-3.18 (m, 9H), 2.87-2.65 (m, 4H), 2.35 (s, 3H), 1.4 (d, 3H).

5

Example 11**4-Bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]benzamide (E11)**

- 10 Following the procedure outlined in example 1, 5-amino-7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran (D17) (230 mg) was converted to the title compound (399 mg, 97%) Mp 73-5° C.

15 ¹H NMR 250 MHz (CDCl₃) δ: 7.84-7.44 (m, 4H), 7.2 (s, 1H), 6.82 (s, 1H), 5.08-4.89 (m, 1H), 3.39-3.02 (m, 5H), 2.92-2.75 (m, 1H), 2.69-2.52 (m, 4H), 2.47 (s, 3H), 2.35 (s, 3H), 1.5 (d, 3H).

Example 12**N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide (E12)**

Following the procedure outlined in example 6, 7-(4-methylpiperazin-1-yl)-5-amino-2,3-dihydrobenzofuran (D6) (166 mg) was converted to the title compound (358 mg, 98%) Mp 80-85° C.

25

¹H NMR 250 MHz (CDCl₃) δ: 8.08-7.89 (m, 4H), 7.82 (s, 1H), 7.51-7.41 (m, 2H), 7.35 (d, 1H), 7.3-7.24 (m, 1H), 6.9 (s, 1H), 4.64 (t, 2H), 3.3-3.08 (m, 6H), 2.75-2.5 (m, 7H), 2.35 (d, 6H).

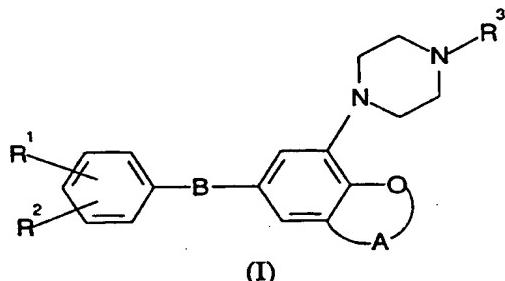
30 **Example 13****N-[7-(Piperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide hydrochloride (E13)**

- Following the procedure outlined in example 8, N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide (E12) (200 mg) was converted to the title compound (159 mg, 76%) Mp 159-162° C.

¹H NMR 250 MHz (CD₃OD) δ: 8.07-7.98 (m, 3H), 7.94 (d, 1H), 7.55-7.48 (m, 2H), 7.4 (d, 1H), 7.25 (s, 2H), 4.62 (t, 2H), 3.5-3.2 (m, 10H), 2.68 (s, 3H), 2.36 (s, 3H).

CLAIMS:

1. A compound of formula (I) or a salt thereof:



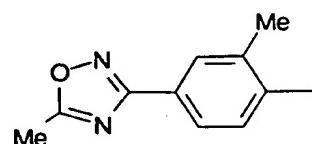
5

in which

- R¹ is halogen, C₃-6cycloalkyl, optionally substituted phenyl or an optionally substituted 10 5-7-membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur;
- R² is hydrogen, halogen, C₁-6alkyl, C₁-6alkoxy, acyl, nitro, trifluoromethyl or cyano;
- R³ is hydrogen or C₁-6alkyl; and
- A is -(CR⁴R⁵)_m- or -O(CR⁴R⁵)_n- where R⁴ and R⁵ are independently hydrogen or 15 C₁-6alkyl, m is 2, or 3;
- n is 1, 2 or 3 and
- B is CONH or NHCO.

2. A compound according to claim 1 in which R¹ is halogen, pyridyl or a 20 disubstituted phenyl group.

3. A compound according to claim 1 or 2 in which R¹ is:

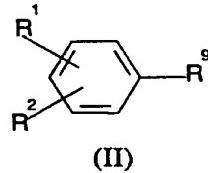


25

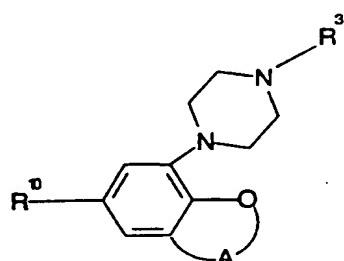
4. A compound according to any one of claims 1 to 3 in which R² is hydrogen.
5. A compound according to any one of claims 1 to 4 in which R³ is hydrogen or methyl.
6. A compound according to any one of claims 1 to 5 in which A is CH₂CH₂ or 30 OCH₂CH₂ and B is CONH.
7. A compound according to claim 1 which is

4-bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide,
 4-bromo-3-methyl-N-[7-(piperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]benzamide,
 4-bromo-3-methyl-N-[5-(4-methylpiperazin-1-yl)-1,4-benzodioxan-7-yl]benzamide,
 4-(4-pyridyl)-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-
 5 yl]benzamide,
 4-(4-pyridyl)-3-methyl-N-[5-(4-methylpiperazin-1-yl)-1,4-benzodioxan-7-yl]benzamide,
 N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]-2'-methyl-4'-(5-
 methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide, or
 N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-yl]-2'-methyl-4'-(5-
 10 methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide,
 N-[7-(Piperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-
 1,2,4-oxadiazol-3-yl)biphenyl-4-carboxamide,
 4-Bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2,2-dimethylbenzofuran-5-
 yl]benzamide,
 15 N-[7-(piperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-
 oxadiazol-3-yl)biphenyl-4-carboxamide,
 4-Bromo-3-methyl-N-[7-(4-methylpiperazin-1-yl)-2,3-dihydro-2-methylbenzofuran-5-
 yl]benzamide,
 N-[7-(4-methylpiperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-
 20 oxadiazol-3-yl)biphenyl-4-carboxamide,
 N-[7-(Piperazin-1-yl)-2,3-dihydrobenzofuran-5-yl]-2'-methyl-4'-(5-methyl-1,2,4-
 oxadiazol-3-yl)biphenyl-4-carboxamide,
 or a pharmaceutically acceptable salts thereof.

25 8. A process for the preparation of a compound of formula (I) which comprises
 (a) reaction of a compound of formula (II):



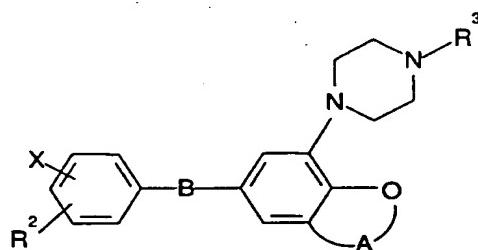
30 with a compound of formula (III):



5 in which R^1 , R^2 , R^3 and A are as defined in formula (I) and R^9 and R^{10} contain the appropriate functional group(s) necessary to form the B moiety;

(b) reaction of a compound of formula (IV):

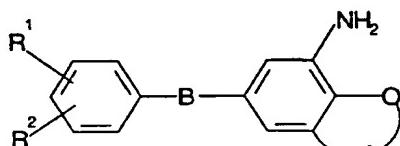
10



in which R^2 , R^3 , A and B are as defined in formula (I) and X is a leaving group with a nucleophile R^1 where R^1 is as defined in formula (I); or

(c) reaction of a compound of formula (V):

20

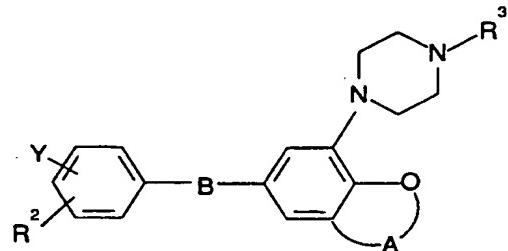


in which R^1 , R^2 , A and B are as defined in formula (I) with a compound of formula (VI):

25 $R^3N(CH_2CH_2Hal)_2$ (VI)

in which R^3 is as defined in formula (I) and Hal is halogen, or

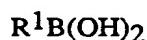
(d) reaction of a compound of formula (VII):



5

in which R^2 , R^3 , A and B are as defined in formula (I) and Y is halogen or a group - OSO_2CF_3 with a compound of formula (VIII):

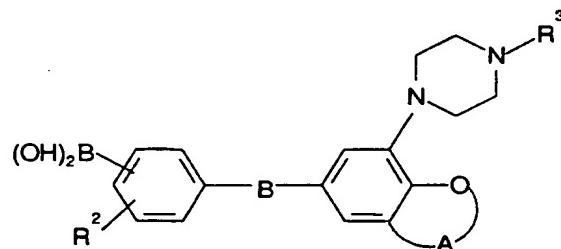
10



(VIII)

15 in which R^1 is as defined in formula (I), or

(e) reaction of a compound of formula (IX):



20

(IX)

in which R^2 , R^3 , A and B are as defined in formula (I) with a compound of formula (X):

25



(X)

in which R^1 is as defined in formula (I) and Y is as defined in formula (VII),

and optionally thereafter:

- converting a compound of formula (I) into another compound of formula (I)
 - forming a pharmaceutically acceptable salt.
9. A compound according to any one of claims 1 to 7 for use in therapy.
- 5 10. A pharmaceutical composition which comprises a compound according to any one of claims 1 to 7 in association with a pharmaceutically acceptable carrier or excipient.

INTERNATIONAL SEARCH REPORT

Inte... nal Application No
PCT/EP 94/03387

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C07D307/79 C07D319/18 C07D405/12 C07D413/12 A61K31/495

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C07D A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 533 266 (GLAXO GROUP RESEARCH LTD.) 24 March 1993 cited in the application see claims ---	1-10
A	EP,A,0 533 267 (GLAXO GROUP RESEARCH LTD.) 24 March 1993 cited in the application see claims ---	1-10
A	EP,A,0 533 268 (GLAXO GROUP RESEARCH LTD.) 24 March 1993 cited in the application see claims ---	1-10
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

9 December 1994

Date of mailing of the international search report

22. 12. 94

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Chouly, J

INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/EP 94/03387

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	JOURNAL OF MEDICINAL CHEMISTRY, vol.37, no.15, 22 July 1994, WASHINGTON US pages 2253 - 2257 J.W. CLITHEROW ET AL. 'Evolution of a novel series of ((N,N-Dimethylamino)propyl)- and piperazinylbenzanilides as the first selective 5-HT1D antagonists.' see the whole document ---	1-10
P,A	JOURNAL OF MEDICINAL CHEMISTRY, vol.37, no.17, 19 August 1994, WASHINGTON US pages 2761 - 2773 B.J. VAN STEEN ET AL. 'Structure-affinity relationship studies on 5-HT1A receptor ligands. Heterobicyclic phenylpiperazines with N4-aralkyl substituents.' see the whole document -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int'l Application No

PCT/EP 94/03387

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0533266	24-03-93	AU-A-	2452992	25-03-93
		CA-A-	2078506	19-03-93
		JP-A-	6107649	19-04-94
		US-A-	5356893	18-10-94
EP-A-0533267	24-03-93	AU-A-	2452892	25-03-93
		AU-A-	2568792	27-04-93
		CA-A-	2078507	19-03-93
		CN-A-	1073430	23-06-93
		WO-A-	9306084	01-04-93
		FI-A-	941261	17-03-94
		JP-A-	6107637	19-04-94
		NO-A-	940974	17-03-94
		US-A-	5358948	25-10-94
EP-A-0533268	24-03-93	AP-A-	303	28-01-94
		AU-A-	2453092	25-03-93
		CA-A-	2078505	19-03-93
		HU-A-	65608	28-07-94
		JP-A-	6116251	26-04-94
		US-A-	5340810	23-08-94
		CN-A-	1076195	15-09-93